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17 August 1962

MEMORANDUM FOR: Deputy Director for Research, CIA

SUBJECT: Comments on the Selection of Photographic Collection Systems for Surveillance and Technical Intelligence

REFERENCE: Memorandum for Director, National Reconnaissance Office; Subject: NPIC Requirements for Photo Quality Based on Anticipated COMOR Requirements, Dated 8 August 1962

1. Many factors must be considered in any decision to select a specific photo reconnaissance system. These factors would include resolution, reliability, scheduling, flexibility, payload capacity, vulnerability, exploitation suitability, coverage, special innovations, and others. NPIC cannot address itself to all these factors and, therefore, comments shall be limited to resolution, coverage, and exploitation suitability.

2. The data shown in the enclosed table are based on information available at NPIC and assume no IMC errors, perfect vehicle attitude, no degradation due to Coriolis acceleration, and no degradation due to atmospheric effects.

3. An analysis of camera and vehicle data at NPIC has been accomplished and the comments offered below are the result of this analysis.

a. The LANYARD program should provide coverage in the surveillance category (resolution of five feet on a side or greater), but it appears to be relatively unsuitable for a surveillance role because of the limited transverse coverage and lack of complete stereo (80 nautical miles stereo coverage with alternate 80-mile gaps). Further, the T/7 lens might preclude use of fine grain emulsions such as S.O. 132 for year-round operations. The stellar camera is the only means whereby attitude of the LANYARD vehicle may be determined. This camera lens axis is mounted in a horizontal position to one side and when the vehicle is rolled in one direction the stellar camera will not produce stellar images. For these reasons, it would appear that this system has some serious drawbacks which should be carefully considered.

b. The "J" program might be considered for gradual phase-in so that the present KH-4 system could be continued as required if the "J" system did not prove reliable.

c. The M-2 proposal might be considered as a more advanced "workhorse" in the surveillance area because of its better ground resolution, complete stereo coverage, and good transverse coverage. This system, or a system of similar specifications, could be programmed for utilization as soon as available in order to supplement, and perhaps eventually replace, the present KH-4 system.

d. All the systems on the enclosed table may be considered as surveillance systems with the exception of GAMBIT and VALLEY. GAMBIT, with a photo resolution design goal of two feet, might be considered for development to provide photographic quality approaching that required for technical intelligence. The conclusions expressed in the reference would appear to support the need for the development of the VALLEY system as soon as practicable.

e. Consideration might also be given to a system to provide photo quality between GAMBIT and the M-2 (possibly in the three to five foot detection size at 2:1 contrast-dynamic).

f. It is suggested that additional consideration be given to the problem of achieving circular orbits at very low altitude. This technique requires superb vehicle control, but it also provides better scale photography and, therefore, better resolution. This might prove cheaper than developing longer focal length cameras; for example, photo quality achieved at 90 nautical miles altitude with a 24-inch focal length lens would require the use of a 30" focal length lens at 123 nautical miles (considered the present nominal altitude) to achieve the same quality. On many occasions, photography has been achieved from altitudes well above 200 nautical miles on KH-4 missions producing unnecessarily small photo scales and resulting in reduced information.

g. The incorporation of 1.5 mil film would essentially double the film carrying capacity of any system and might be programmed as soon as possible.

h. It is urged that continued emphasis be given to stereo coverage for both surveillance and technical intelligence systems.

4. The request from the Deputy Director for Research, CIA, for NPIC commentary on proposed future reconnaissance systems is

welcomed, and it is hoped that this type of liaison will be maintained. It is believed that the experience NPIC has obtained in working with all types of photography could be helpful to NRO in its consideration of future systems.

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ARTHUR C. LUNDAHL
Director
National Photographic Interpretation Center

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Attachment

Attachment 1

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DATA BASED ON INFORMATION AVAILABLE AT NPIC

	F.L.	Film Width	Stereo	T-Stop	Detection Size (2:1 Contrast-Dynamic)	Coverage at 123 nm altitude with 3 mil film
KH-4	24"	70 mm	Complete	T/4	13.5' Itek 10' Lockheed	172 x 30,657 nm
J	24"	70 mm	Complete	T/4	13.5' Itek 10' Lockheed	172 x 61,314 nm
M-2	40"	5"	Complete	T/4	7.5'	142 x 23,860 nm
LANYARD	66"	5"	In stereo mode 80 nm stereo and 80 nm gaps	T/7	5.6'	47 x 25,200 nm
201 (698 BJ)	36"	6.6"	Complete	T/5	9.8'	172 x 66,200 nm
GAMBIT	77"	9.5"	350 targets can be covered in stereo	T/5 (Approx)	2 - 3' Design goal	10.6 nm x variable
VALLEY	(System is unspecified)					50X1
TALENT	36"	2-9.5"	Essentially complete stereo coverage	T/11	1.3' on S.O. 1188 film	78 x 1624 nm

TALENT WAS ADDED TO THIS CHART FOR COMPARISON PURPOSES.

Note: NPIC has discussed the detection size of KH-4 and J with both Itek and Lockheed. Itek assumes 125 l/mm at 2:1 contrast-dynamic (10' detection size) and Lockheed assumes 90 l/mm at 2:1 contrast-dynamic (13.5' detection size).

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